Conics Reference Sheet

Ellipse

$$\text{center} = (h, k)$$
$$\text{horizontal radius} = r_1$$
$$\text{vertical radius} = r_2$$

$$\frac{(x - h)^2}{(r_1)^2} + \frac{(y - k)^2}{(r_2)^2} = 1$$

Ellipse foci

$$\text{if } r_1 > r_2 \qquad\qquad \text{if } r_1 < r_2$$
$$c = \sqrt{(r_1)^2 - (r_2)^2} \qquad c = \sqrt{(r_2)^2 - (r_1)^2}$$
$$\text{foci} = (h \pm c, k) \qquad \text{foci} = (h, k \pm c)$$

Horizontal hyperbola

$$\text{center} = (h, k)$$
$$\text{horizontal radius} = r_1$$
$$\text{vertical radius} = r_2$$

$$\frac{(x - h)^2}{(r_1)^2} - \frac{(y - k)^2}{(r_2)^2} = 1$$

Horizontal Hyperbola foci

$$c = \sqrt{(r_1)^2 + (r_2)^2}$$

$$\text{foci} = (h \pm c, k)$$

Vertical hyperbola

$$\text{center} = (h, k)$$
$$\text{box half-width} = r_1$$
$$\text{box half-height} = r_2$$

$$-\frac{(x - h)^2}{(r_1)^2} + \frac{(y - k)^2}{(r_2)^2} = 1$$

Vertical hyperbola foci

$$c = \sqrt{(r_1)^2 + (r_2)^2}$$

$$\text{foci} = (h, k \pm c)$$